Trans-Lake Washington Project

High-Capacity Transit Technology Options

Trans-Lake Washington Project

Evaluation Criteria

Primary

- Peak passenger capacity per hour per direction
  - For TransLake meet projected 2020 demand – at least 4,500 persons per hour per direction
- Operating interval (headway)
  - In range of 2 to 10 minutes between vehicles (6 to 30 vehicles per hour)
- Operating speed
  - For TransLake provide in-vehicle time competitive with auto – average speed, including stops, of 30-35 mph (consistent with most rapid transit systems)

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Evaluation Criteria

Secondary

- Guideway Issues
  - Curvature---Horizontal/vertical
  - Connection to floating bridge
  - Electrical power feed location
  - Is integration with other future routes required?
- Uniqueness
  - Is future equipment available from multiple sources?
  - Are system/vehicle features proven?
- Life-Cycle Cost
  - Purchase Price
  - Operating Costs
  - Maintenance Costs

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Vehicle Choice Considerations

- Meet design criteria
- Focus on vehicles currently in use

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BRT (60’ Bus)

- On a limited access facility a 60’ bus can provide the capacity using a headway of 1.2 minutes.
- Requires management of other traffic to maintain good level of service
- Growth controlled by capacity of terminal facilities/local street operation

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People Mover (Innovia, VAL)

- Issues:
  - Few seats, unique design, good experience, tire wear, electrical power in guideway
- A four car Innovia train has adequate capacity, however only 32 seats are provided per train. If seats are added the capacity will decrease. Sustained reliable operation at high speed is a concern. With a four minute headway, minimal capacity growth is available.
- A four car VAL train can marginally provide the capacity. With a four minute headway, capacity growth is not available. Seating is marginal, with an increase lowering capacity.

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Monorail (Bombardier M-VI)

- Issues:
  - Unique design, tire wear, electrical power in guideway
- A six car train has adequate capacity. With a four minute headway excess capacity is not available. Sustained reliable operation at high speed is a question.

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Skytrain (Bombardier new design)

- Issues:
  - Low profile rapid transit, good experience, unique design, lower efficiency, two third rails
- This system has excess capacity and high capacity growth potential, as expected for a low profile rapid transit type design. It requires a unique guideway design that uses two power feeder rails. The traction motor reaction rail is between the running rails. Propulsion system efficiency is lower than other systems. The existing design has minimal seating; this can be increased with a reduction in capacity.

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LRV (St. Louis, Cityrunner)

- Issues:
  - All boarding options available, conventional track, overhead power feed, can operate around tight curves, several proven suppliers available
- LRV, Conventional High Floor
  - A two car train has excess capacity with full 2x2 seating. Capacity can be increased by adding additional cars, up to a total of four, without exceeding weight or length limitations. With conventional track design used, vehicles can be purchased from several experienced suppliers. Can easily be integrated with other systems that use conventional track design.
- LRV, Modular Design
  - The seven section Cityrunner design does not have adequate capacity.

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Diesel MU (Adtranz GTW)

- Issues:
  - One third or one half axles powered with engine, low acceleration, has issues of emissions, noise, odor, maintenance cost
- The design to be delivered to New Jersey does not have adequate capacity. The next larger design marginally meets the capacity with no growth capability. Train acceleration will be low with either 1/3 or ½ the axles being powered, depending on the design considered.

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Rapid Transit (Boston #3 Red Line)

- Issues:
  - High passenger capacity. 70 mph top speed, good experience, third rail, several vehicle suppliers available.
- As expected this technology has excess capacity. The TransLake corridor, with 1.5 mile average station spacing, gains limited benefit from the higher speed capability. This technology can be provided by a broad spectrum of vehicle designs.

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Commuter EMU (Montreal)

- Issues:
  - High passenger capacity.Can use overhead or third rail power feed. 85' car can have excessive overhang
- This technology also has excess capacity. With a car length of 85', that is not articulated, car overhang of the track may be a concern. Cars can be powered from an overhead wire or a third rail.

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Locomotive-Hauled Commuter

- Issues:
  - Only electric design has sufficient horsepower. Low acceleration, high axle weight

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Vehicles Not Considered

- Personal Rapid Transit (PRT)
  - Insufficient capacity
- High Speed Rail
  - The TransLake corridor, with 1.5 mile average station spacing, gains limited benefit from the higher speed capability
- MagLev
  - The TransLake corridor, with 1.5 mile average station spacing, gains limited benefit from the higher speed capability
  - Frequent acceleration and deceleration increases energy demands

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Current Technological Advances

- Bus
  - Several fuel and propulsion systems being developed, with fuel cell power of great significance. A bus can use engine, electric, hybrid, or battery
- People Movers
  - New concepts continue to emerge. However, the technology has typically provided small, lower speed vehicles

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- LRV
  - 100% Low Floor
  - Multiple articulated designs
  - New traction drive arrangements
- Rapid Transit
  - Articulated designs (cost, weight)
  - Extensive computer control and diagnostics
  - Not all axles powered
- Locomotives
  - Higher horsepower
  - Lighter weight
  - Improved Head-End Power system

ONE WAY LINE CAPACITY
PASSENGERS PER HOUR

TECHNOLOGY	***SEATS***	***HEADWAY IN MINUTES (TRAINS PER HOUR)***			
		2 30	4 15	10 6	20 3
BRT 60' Artic	66	2580	1290	518	259
Innovia					
1 car	8	2700	1350	540	270
4 cars	32	10800	5400	2160	1080
Val					
2 cars	50	4800	2400	960	480
4 cars	100	9600	4800	1920	960
Monorail					
3 cars	60	5040	2520	1008	504
6 cars	120	10080	5040	2016	1008
Skytrain-Kennedy					
1 car	26	4740	2370	948	474
4 car	104	18960	9480	3792	1896
Skytrain-Vancouver					
1 car	42	3840	1920	768	384
4 cars	168	15360	7680	3072	1536
LRV (St. Louis)					
1 car	72	5700	2850	1140	570
2 cars	144	11400	5700	2280	1140
3 cars	216	17100	8550	3420	1710
LRV Extended					
7 Sections	80	7260	3630	1452	726
DMU - Artic					
GTW 2/6	100	6000	3000	1200	600
GTW 4/8	184	9540	4770	1908	954
HR MBTA #3 Red Line					
2 cars	100	9600	4880	1920	960
6 cars	300	28800	14400	5760	2880
Commuter EMU					
2 cars	356	10680	5340	2136	1068
4 cars	712	21360	10680	4272	2136